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Characterizing outdoor recreation user groups: A typology of peri-urban recreationists in the Kromme Rijn area, the Netherlands

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ABSTRACT

Increasing urbanization accompanied by a growing demand for recreational use of peri-urban green spaces is likely to cause land-use conflicts. The nature of these conflicts is subject to the heterogeneous preferences of outdoor recreationists. Although the importance of diversifying between recreational user groups has been acknowledged in the literature, most studies - and especially studies on landscape preferences - focus on specific user groups and are not operationalized for creating a recreationist typology. This study presents a typology on case-study level accounting for variations in landscape preferences, visitation behavior, and socio-demographic information. The typology is based on data originating from a structured questionnaire with a total of 200 respondents. It is constructed by employing two commonly used data-driven methods for typology development: PCA of preferences for landscape characteristics and cluster analysis of all data (landscape preferences, visitation behavior and socio-economic variables) to derive alternative typologies. Comparing the results of both types of analysis leads to a consistent picture of the main differences between three distinct outdoor recreation user groups which we refer to as 'the convenience recreationist', 'the day tripper' and 'the culture/nature recreationist'. The first user group prefers convenient, short-term recreation, close to home. The second group is characterized by clear preferences for one-day recreational activities and destinations, while the last group is mainly defined by its strong interest in culture and nature. Our study identified large variations in outdoor recreation preferences and recreation needs between these three user groups. Understanding the heterogeneity of recreation preferences can help to articulate effective landscape management strategies, targeted to ensure the multi-functional character of peri-urban landscapes for different types of users.

1. Introduction

Over the last decades, European landscapes have been subject to rapid and profound changes due to increasing urbanization as well as changing levels of agricultural land-use intensity (Zasada, 2011). These changes have resulted in peri-urban areas where agricultural functions are being increasingly integrated with the recreational and leisure demands of urban and rural dwellers (Almeida et al., 2016; Žlender and Ward Thompson, 2016). Multifunctional land use in peri-urban areas is likely to cause land-use conflicts that occur whenever different user groups have incompatible interests related to certain land units (Steiner, 2012; Von der Dunk et al., 2011). Potential land-use conflicts, in the context of outdoor recreation in peri-urban green spaces, vary according to the heterogeneous preferences of outdoor recreation groups (Bell et al., 2007; Komossa et al., 2018; Pröbstl et al., 2010).

Outdoor recreation refers to leisure time activities spend in green areas that generally form part of people's daily or weekly routines (Silvennoinen and Tyrväinen, 2001). As such, it is increasingly recognized as an important contribution of ecosystems to human well-being (Bennett et al., 2015; MEA, 2003; Plieninger et al., 2015). People's motivations influence the type of outdoor recreation people engage in, including short-term recreation in nearby green space, one-day or overnight tourism (Daniel et al., 2012), educational recreation (Holdnak and Holland, 1996; Smith and Jenner, 1997), spiritual recreation (Sharpley and Jepson, 2011), or nature tourism (Kline, 2001). Outdoor recreation can be classified as a Cultural Ecosystem Service (CES), covering "all the non-material, and normally non-consumptive, outputs of ecosystems that affect physical and mental states of people" (Haines-Young and Potschin, 2012). CES contribute to physiological, attentional and emotional stress-recovery (Kaplan and Kaplan, 1989;

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Korpela and Borodulin, 2014; Thompson et al., 2012). These benefits emerge from people's interactions with ecosystems through which they actively create and express their relation with the natural environment (Fish et al., 2016). Quantifying and understanding outdoor recreation as a CES requires knowledge of the recreationists' preferences and perceptions regarding their enjoyment of the natural environment (Weyland and Laterra, 2014; Daniel et al., 2012).

To describe variations among outdoor recreationists, three aspects frequently appear in the literature, namely landscape preferences, visitation behavior, and socio-demographic characteristics (a review of this literature can be found in Annex A). Landscape preferences can in general be defined by both cognitive (e.g. Sevenant and Antrop, 2009) and physical landscape attributes (e.g. Arnberger and Eder, 2011). Cognitive landscape attributes, hereafter referred to as *landscape characteristics*, provide a holistic assessment of landscape character, often with a specific focus on visual aspects (e.g. complexity, see Tveit et al., 2006). Preferences for physical landscape attributes in turn concern preferences for tangible and quantifiable *landscape elements* (e.g. presence of historic buildings, see Van Zanten et al., 2014). In this paper, we assess both perspectives, as we include preferences for landscape characteristics, such as naturalness or wilderness, as well as preferences for specific landscape elements, which we define here as "biophysical attributes of the scenes that are objectively measured" (Santos, 1998, p. 81). There is a great diversity of studies that relate physical landscape attributes to the subjective preferences of different user groups. For instance, Junge et al. (2011) found that both farmers and non-farmers prefer either a mixed land-use type, or one dominated by arable crops, over landscapes dominated by grassland, while Rambonilaza and Dachary-Bernard (2007) detected that visitors and local residents diverge in their ranking of preferences for agricultural landscape. Only a minority of studies on landscape preferences are tailored to outdoor recreation explicitly. The body of literature as presented in for instance the meta-analysis of van Zanten et al. (2014) shows that only 18% of the included studies recognize recreationists as a user group (see e.g. Gómez-Limón et al., 1999; Rambonilaza and Dachary-Bernard, 2007; Willis and Garrod, 1993).

The literature that does include recreationists only partly addresses the heterogeneity within this complex user group that follows from variations in landscape preferences, visitation behavior, and socio-demographic characteristics. In a great many studies, two out of these three aspects, in varying constellations, are combined in order to distinguish between various recreational groups. For instance, some of the studies highlight the connection between landscape preferences and socio-demographic variables (e.g. Howley et al., 2012; Kim et al., 2002; Swanwick, 2009). A common connection regularly made in this context is one between age and landscape preferences. Van den Berg and Koole (2006) for example found that elderly people as a recreational user group are less attracted to wild natural landscapes than younger generations. A different correlation is provided by Yu (1995) who uncovered that place of residence (e.g. urban or rural) and education level affect the landscape preferences held by recreationists.

Furthermore, the literature suggests that recreationists' landscape preferences are to an important degree informed by their visitation behavior and in particular by the activities they engage in. For example, DeLucio and Múgica (1994) established that people engaging in dynamic and adventurous activities prefer mountainous landscapes with some degree of hostility, while more casual visitors of their case-study areas prefer more peaceful landscapes. A case study in Portugal by Surová and Pinto-Correia (2016) found that the recreational user group of hunters prefer open natural areas, thereby ascribing little value to the aesthetical-scenic qualities of those landscapes (Surová and Pinto-Correia, 2016). Bastian et al. (2015) discerned that hikers have a penchant for attractive nature.

In addition, a variety of case studies focuses on the link between socio-demographic characteristics and visitation behavior, which is also a common method in tourism demand research (Bigné and Gnoth, 2008). In these studies, visitation behavior is described through numerous variables, including recreational activities, frequency of visits, length of stay, mode of transportation, use of facilities and spending behavior (see e.g. Alegre and Pou, 2006; Juutinen et al., 2017; Mehmetoglu, 2007a). For example, Pizam et al. (2004) and Meng and Uysal (2008) established a connection between age and gender (male adolescents) and a preference for thrill-seeking activities. Alternatively, Wall-Reinius and Bäck (2011) concluded from a case study conducted in Northern Sweden that the appreciation for adventurous activities such as backcountry hiking has increased over the years among older age groups. This suggests that the link between visitation behavior and socio-demographics not only differs from case study to case study, but also has a diachronic element implying that general behavior patterns are susceptible to change over time.

The combination of all three aspects to diversify between recreationists is rare in the existing literature, despite the fact that their respective importance for recreation policy and regulation has been widely acknowledged. There are a few exceptions, however. Kim et al. (2002), found that the socio-demographic background of recreationists has a distinctive effect on their preferences for both landscape and activity. Wall-Reinius and Bäck (2011) encountered a tight connection between a specific socio-demographic profile (elderly hikers), the use of facilities (preference for quality accommodations and good service) and landscape preferences (natural surroundings, privacy, scenic beauty) in a case-study on hikers in Northern Sweden. These studies focus on specific user groups and are not operationalized for creating a recreationist typology. Establishing such a typology offers landscape planners a tool to assess recreation demand and supply (Devesa et al., 2010), while simultaneously making it possible to locate potential land use conflicts between different user groups by including a spatial landscape perspective (Lopez et al., 2001; Von der Dunk et al., 2011). Thus explicitly accounting for a landscape dimension, the present study extends traditional market segmentation methods with a spatial perspective. Our aim is to develop a typology for outdoor recreationists, accounting for variations in landscape preferences (for both landscape characteristics and elements), visitation behavior, and socio-demographic characteristics. The main contribution of this paper to the literature is the combination of the three aspects explored above in one study to do justice to the heterogeneity among recreationists, thus distinguishing different outdoor recreation user groups instead of viewing them as a large aggregated group. The deeper understanding of the heterogeneity among recreationists obtained is targeted at informing the planning of land use, landscape management and the creation of recreational facilities to the actual groups using the landscape. The typology is defined on case-study level in the Dutch Kromme Rijn area.

2. Material and methods

Previous studies that formulated typologies of outdoor recreation user groups have shown a great variety of methodologies, from more qualitative (e.g. Cohen, 1979) to data-driven approaches (e.g. Cottrell et al., 2005). Also these data-driven approaches diverge and include different statistical techniques, such as factor analysis (De Groot and Van den Born, 2003; Devesa et al., 2010), principal component analysis (Cottrell et al., 2005; Mehmetoglu, 2007b) as well as K-mean cluster analysis (Elands and Lengkeek, 2012). This variety in methodological approaches suggests that there is no consensus on the best method for the formulation of typologies.

Both factor and PCA analysis are often used for typologies where the selection of variables is based on theoretical concepts (e.g. Butzmann and Job, 2017; Guillem et al., 2012). PCA, a widely used statistical, multivariate technique for unsupervised dimension reduction, identifies linear components of a set of variables or - in other words - clusters of variables. It examines the degree of correlation between items based on the patterns of responses with highly correlated items forming a factor (Field, 2013; Ding and He, 2004). Cluster analysis is focused on

emerging patterns in the data (e.g. Ambrose-Oji et al., 2015; Howley et al., 2012). It is still the most common tool used in data driven tourist segmentation (Dolnicar, 2006). K–mean cluster analysis in particular is a commonly used non-hierarchical cluster technique for unsupervised learning tasks. It forms a grouping of a set of variables into a pre-determined number of groups by using centroids to represent clusters by optimizing the squared error function (Ding and He, 2004).

The abovementioned methods are often combined within typology development (Caracelli and Greene, 1993) and customarily also in landscape preference studies (e.g. Christodoulou et al., 2008; Sevenant and Antrop, 2009; Soliva et al., 2010). This combination of methods has rarely been applied in studies focusing on outdoor recreation. An exception is DeLucio and Múgica (1994), who developed a visitor typology of recreationists in Spanish national parks using PCA for landscape preferences and cluster analysis for their attitudes and activities. However, the specific practice of factor-cluster analysis (cluster analysis on factor loadings) is highly criticized (Dolnicar and Grün, 2008). Elands and Lengkeek (2000) as well as Cottrell et al. (2005) avoid this criticism by using PCA analysis directly to create a typology of recreationists.

As PCA and cluster analysis are performing data reduction in different ways - even though unsupervised dimension reduction is closely related to unsupervised learning (Ding and He, 2004) - it can be expected that the choice for deriving at either the one or the other method affects the exact constitution of a typology (Li and Chuang, 2009). To this end, we employ both of these two commonly used data-driven methods for typology development. Unlike studies that create typologies by feeding the results of factor analysis into a cluster analysis, we use both methods separately to derive alternative typologies. First, we develop a typology of recreationists by means of a PCA on preferences for specific landscape characteristics following the method of Cottrell et al. (2005). Second, we create a typology through a cluster analysis inspired by the method of Raadik and Cottrell (2007). Through comparing the outdoor recreation typologies arising from these methods, we can assess the effect the choice for a specific method has on typology formulation.

The landscape characteristics assessed were selected based on a literature review at European level by Komossa et al. (2018), which aimed to provide an overview of common landscape preferences for different outdoor recreation user groups in the EU. In a slight departure from the common understanding of cognitive attributes, the landscape attributes include both visual (e.g. wilderness) as well as non-visual characteristics (e.g. spirituality). As the PCA-based typology was only based on preferences for these landscape characteristics, we analyzed the relationship of each of the identified groups with preferences for landscape elements, visitation behavior, and socio-demographic information respectively.

By contrasting the two approaches to building a typology, we are able to see to what extent the choice for a specific method influences the typology and gain deeper insight in the way the foregrounding of preferences for specific landscape characteristics in the PCA affects the formation of user groups. Fig. 1 provides an overview of the used methods that will be described in more detail in the following sections.

2.1. Study area

The Dutch study region is the Kromme Rijn area, which is located in the Central Netherlands (Fig. 2) in the province of Utrecht. The Kromme Rijn area (219 km^2, 86.090 inhabitants) is a dynamic area that is characterized by a cultural landscape with differences in scale, openness and relief. The name “Kromme Rijn” refers to a 28 km long (small) river that flows through the area, which is a former branch of the river Rhine. The fluvial deposits of the river have strongly influenced the current land use pattern, as fruit orchards are established on the sandy and clay levee deposits of the former riverbed. Fruit cultivation (e.g. apples, pears and cherries) is a financially important sector, which is currently expanding (AVP, 2007; LOS stadomland, 2016). A second important agricultural sector is dairy farming, which mainly takes place on lower lying grassland areas (reclaimed back swamps). Arable land plays a minor role, with cereals (27 ha) and vegetables (1 ha) (CBS, 2016; Provincie Utrecht, 2016). The limited forestry in the area is characterized by the ash-coppice and willow-coppice forests.

The Kromme Rijn area is, due to its physical and cultural landscape, widely used for recreation, attracting around 1.8 million recreationists yearly (Provincie Utrecht, 2016). Its location adjacent to the city of Utrecht adds to the popularity of this peri-urban area as a leisure-time destination. The main recreation areas are defined by diverse landscapes, offering a variety of landscape elements, including riversides, orchards, forests, and cultural heritage sites such as estates and forts belonging to the monumental ‘Nieuwe Hollandse Waterlinie’ (Will and van den Berg, 2002).

2.2. Questionnaire setup

Data used for analysis originates from a questionnaire consisting of five subsections, each having a different purpose within the study (Fig. 3). We have chosen to use multiple methods within the questionnaire including both qualitative open-ended questions to assess the different elements of outdoor recreation preferences. For the quantitative questions, we used a combination of ranking exercises and questions with predefined answers.

The first part of the questionnaire included questions regarding the visit of the case study area, such as visitation frequency, duration and activities. The second part of the questionnaire addressed the recreationists’ preferences for landscape characteristics such as naturalness and preferences for specific landscape elements typical for the Kromme Rijn area. Ten different typical landscape elements were identified for the Kromme Rijn area: cultural heritage sights (e.g. fortresses, mills), meadows, agricultural lands, fruit orchards, rivers and water, tree lines and hedgerows, forests, marshes, farm animals, wildlife animals, and villages. Respondents were asked to indicate their preferences through the evaluation of photos. In order to ensure that the characteristics of a specific photo did not affect the respondents’ judgement, we captured each element in three different pictures, with each picture showing similar weather conditions (Soliva et al., 2010) a similar brightness as well as a similar height of the horizon (e.g. Al-Kodmany, 1999; Barroso et al., 2012). This method has been successfully employed by earlier studies on landscape preference (see e.g. Arriaza, 2004; Van Berkel and Verburg, 2014). The third part of the questionnaire included questions regarding the recreationists’ use of facilities during their recreational stay. The last part of the questionnaire related to the recreationists’ socio-demographic information. All questions were informed by a literature review of earlier studies that identify the variables and factors determining socio-demographic information, visitation behavior, and landscape preferences. A short summary of this literature review is provided in Supplementary material Annex A while the full questionnaire is provided in Annex B.

2.3. Sampling approach

A convenience sample of outdoor recreationists was used, focusing on the maximum of variety (e.g. gender, age, income, recreational activity) among respondents (Strauss et al., 1996). The target population consisted of recreationists within the case study area Kromme Rijn, the Netherlands, including all age groups, level of education, both sexes, and all levels of recreational engagement in the outdoor environment. Respondents were interviewed in Dutch and German at strategically selected recreation sites in order to capture the diversity and multifunctionality of the case study area. A total of 200 persons were interviewed with an average interview duration of approximately 15–20 min; the interviews were conducted between 22 October and 13 November 2016.

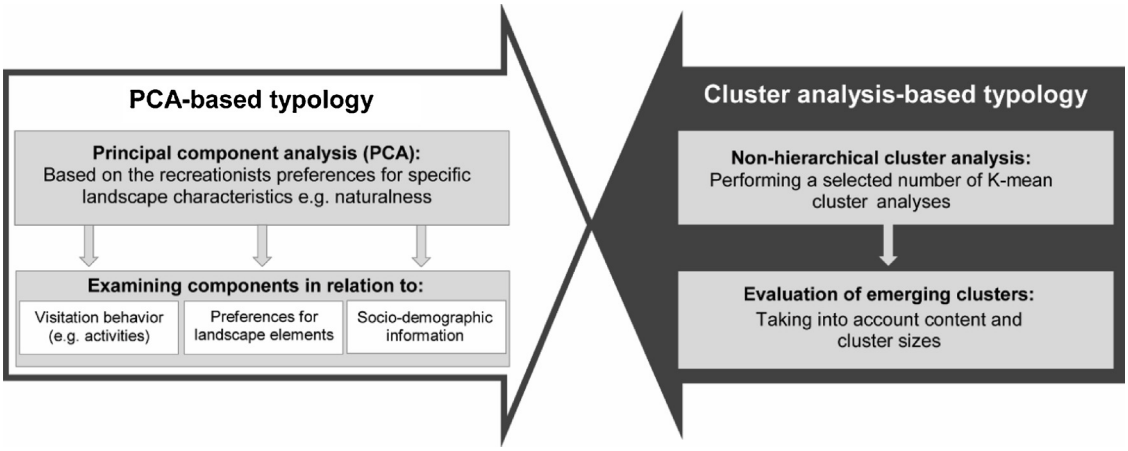


Fig. 1. Overview of methods.

2.4. Data analysis

Statistical analyses were performed using SPSS 23.0. Before the analyses, questionnaire data were initially explored to gain information on the distribution and the existence of possible outliers. The homogeneity of variance of quantitative responses was tested using the Levene's test. This preliminary data check resulted in the exclusion of 2 variables. The variable 'canoeing' as a recreational activity was excluded, as it was relevant for less than 0.5% of the total sample. The variable 'nationality' was excluded due to its homogeneity, as 93% of the sample was of Dutch origin. For an overview of all variables used in the analyses, see Table 1.

We first conducted a principal-components analysis (PCA) to form a typology of recreationists based on preferences for specific landscape characteristics. For the PCA, we used a group segmentation procedure, similar to the techniques used by Elands and Lengkeek (2000). This technique first includes calculation of a weighted sum score for which the original scores assigned by respondents to specific preferences for landscape characteristics were first summed and subsequently divided by the number of summed-up variables. We were then multiplying the item score with the factor loading – referring to the extent each item contributes to the content of the factor: the higher the factor loading the higher the content contribution – to calculate the relative importance of each item contributing to the explanation of a factor. The final scores on each factor are therefore the result of a balanced judgement of the items. The next step of the process involved an allocation procedure to classify each recreationist according to their final factor scores (highest score).

Part 1	**Visit of the case study area:** visitation frequency & duration, activities, description of landscape preferences
Part 2	**Landscape preferences:** preferences for landscape characteristics & landscape elements
Part 3	**Facility use:** gastronomic facilities , local products, accommodation, cultural facilities, other facilities
Part 4	**Socio-demographic information:** gender, age, place of origin, place of residence, profession, income, level of education

Fig. 3. Content of the questionnaire. Specification of questions available in the Supplementary material Annex B.

To analyze the group differences with regard to 1) preferences for

Fig. 2. Map of the location of the case study area in Central Netherlands. In green the study area outline, in dark grey the outline of Utrecht province (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

Table 1
Overview of variables used in the analysis, including variables of landscape preferences (characteristics and elements), visitation behaviour, and socio-demographic information.

Variables		
Landscape preferences	Visitation behavior	Socio-demographic information
Landscape preferences (characteristics)	*Activities*	*Education*
Degree of attractiveness Degree of naturalness Cultural landscape Suitability for sport tourism Unique character of a landscape Degree of human disturbance Educational level of a landscape Wilderness Spirituality	Hiking Biking Dog walking Running Race biking Picnicking Fishing Wild food Education Spirituality Other	None Basic education High school Middle-level applied education Higher professional education Academic education
Landscape preferences (elements)	*Facilities*	*Income*[a]
Cultural heritage Meadows Agricultural lands Fruit orchard Rivers and Water Tree lines and Hedgerows Forests Marshes Farm animals Wildlife animals Villages	Gastronomy Local products Accommodation Cultural facilities Other facilities	Beneath 0.5x average Between 0.5x average and average About average Between average and 2x average More than 2x average I'd rather not say.
	Frequency of visit	*Gender*
	Daily 1 to several times a week 1-3 times per month Nearly every month 1 to 2 times a year > 2 x a year First time	Male Female
	Length of stay	*Age*
	1 hour 2-3 hours Half a day Entire day	18-25 yr 25-35 yr 35-45 yr 45-55 yr > 55 yr
	Travel distance from place of residence	
	0-8 km 8-75 km 75-150 km 150-200 km > 200 km	

[a] Average income in the Netherlands in 2016 was €2.808 gross (CPB, 2018).

landscape elements, 2) visitation behavior and 3) socio-demographic information, we conducted separate univariate ANOVAs for the variables that showed non-significant in the Levene's test. For the variables that showed significant, we used the non-parametric Kruskal-Wallis test followed by a Bonferroni-Dunn test for multiple comparison to analyze the group differences of the ordinal data. For binary data, we used Pearson's Chi-square test and Fisher's exact test, with the latter being more suitable for small sample sizes.

To develop the typology based on cluster analysis, we performed a selected number of K-mean cluster analyses using the original input data (see Table 1) and evaluated the emerging clusters with respect to its contents and cluster sizes. We subsequently conducted a discriminant function analysis to check if the groups are statistically significant and if the variables significantly discriminate between the groups.

3. Results

3.1. Respondent characteristics and preferences

The average age of respondents was 55 years. Our sample consisted of slightly more females (54%) than males (46%). The respondents have generally a high education level (68% higher professional education or academic education) with 74% having an average to higher income level. Ninety-three percent of the respondents originate from different locations in The Netherlands. The remaining originate from Germany (4%) or other countries (3%). The general duration of recreation was reported to be 2–3 h (36%), followed by an entire day stay (27%). Recreationists tend to return to the recreation areas: 28% on a weekly basis and 19% 1–3 times a month.

The main activities done in the case study area were hiking (78%), followed by biking (29.5%) and engaging in educational activities (19.5%). The main facilities used were facilities placed in our 'other facilities' group such as hiking or biking paths, benches or toilets (58%), gastronomy (55.5%) and cultural facilities (28%).

When asked which 3 landscape characteristics (with 1 being the first choice, 2 the second choice and 3 the third choice) recreationists prefer during their activities, recreationists stated naturalness as most attracting ($\bar{x} = 1.39$), followed by a high degree of scenic beauty ($\bar{x} = 1.15$) and a high degree of uniqueness of a landscape ($\bar{x} = 0.98$).

The results of the photo assessment of preferred landscape elements are shown in Fig. 4. Rivers/water as specific landscape elements would best describe the respondents' preferences ($\bar{x} = 1.93$), followed by forests ($\bar{x} = 0.84$) and cultural heritage ($\bar{x} = 0.80$).

3.2. PCA–based typology

3.2.1. PCA of preferences for landscape characteristics

A principal-components analysis with varimax rotation, using 9 landscape preferences that are all rewarded on a scale from 0 to 3, with an Eigenvalue of one, accounted for 71% of the total variance when 5 components were retained (Table 2). The choice to retain 5 components was based on the Kaiser's criterion. Component 1 includes items regarding preferences for a high education level of the landscape with a relatively high degree of human disturbance (and consequently a low degree of naturalness). The second component includes items describing the preference for a high landscape suitability for sport tourism but low appreciation of cultural elements in the landscape. Component 3 consists of items concerning the preferences for a high degree of scenic beauty and a low degree of uniqueness of a landscape. Component 4 is formed around an item describing preferences for low values of wilderness and component 5 by recreationists' preferences for a high spiritual value of a landscape. The principal components identified in this way partition the variance between recreationists based on their preferences for landscape characteristics. Based on these results the respondents were classified into 5 distinct user groups distinguished by their preferences for landscape characteristics.

3.2.2. Relationships between user groups and variables of landscape elements, visitation behavior and socio-demographic information

To examine relationships between recreational user groups and landscape elements, we used the non-parametric Kruskal-Wallis test followed by a Bonferroni-Dunn test. Results are presented in Table 3.

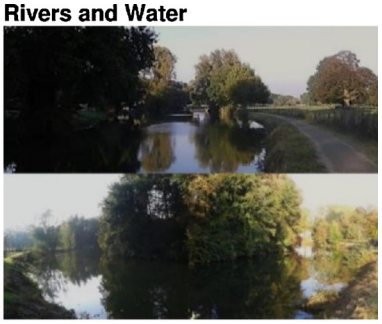
Tree lines and Hedgerows

1st choice	4%
2nd choice	7%
3rd choice	5%
Sample mean	0.32

Fruit orchard

1st choice	4%
2nd choice	6%
3rd choice	8%
Sample mean	0.33

Rivers and Water



1st choice	45%
2nd choice	23%
3rd choice	13%
Sample mean	1.93

Forests

1st choice	15%
2nd choice	15%
3rd choice	10%
Sample mean	0.84

Cultural heritage

1st choice	9%
2nd choice	17%
3rd choice	20%
Sample mean	0.80

Agricultural lands

1st choice	0%
2nd choice	1%
3rd choice	2%
Sample mean	0.03

Meadow

1st choice	3%
2nd choice	4%
3rd choice	9%
Sample mean	0.26

Farm animals

1st choice	1%
2nd choice	3%
3rd choice	6%
Sample mean	0.16

Wildlife animals

1st choice	8%
2nd choice	11%
3rd choice	13%
Sample mean	0.60

Marshes

1st choice	7%
2nd choice	7%
3rd choice	10%
Sample mean	0.45

Villages

1st choice	3%
2nd choice	7%
3rd choice	7%
Sample mean	0.31

Fig. 4. Pictures of landscape elements as presented in the questionnaire with respondents' preferences for specific landscape elements in the Kromme Rijn area as % of total respondents and sample mean value.

Table 2
Principal component analysis of landscape preferences for specific landscape characteristics.

Landscape preferences (characteristics)	Component				
	1 (n = 33)	2 (n = 46)	3 (n = 67)	4 (n = 38)	5 (n = 16)
Degree of naturalness	−.831				
Educational level of a landscape	.583				
Degree of human disturbance	.531				
Cultural landscape		−.734			
Suitability for sport tourism		.725			
Unique character of a landscape			−.866		
Degree of attractiveness/ scenic beauty			.560		
Wilderness				−.988	
Spirituality					.899
Eigenvalue[a]	1.394	1.332	1.297	1.204	1.161
% Variance Explained	15.486	14.800	14.408	13.378	12.896

Note: Items with Factor loading < .40 not included in the results.
[a] The Eigenvalue = 1 default setting.

Table 3
Distribution of outdoor recreationists over independent variables of landscape elements and outdoor recreation user groups based on landscape preferences (underlined values signal the significant effects of the Kruskal-Wallis test with $p < .05$).

Landscape elements	Mean of total sample	Outdoor recreation user group (mean value)					Significance of group differences
		1	2	3	4	5	
Cultural heritage	0.80	0.97	1.15	0.87	0.37	0.19	.000
Meadows	0.26	0.27	0.26	0.30	0.26	0.06	.811
Agricultural lands	0.03	0.03	0.02	0.00	0.08	0.00	.413
Fruit orchard	0.33	0.12	0.43	0.34	0.26	0.56	.358
Rivers and Water	1.93	2.30	1.54	2.07	1.79	1.94	.061
Tree lines and Hedgero-ws	0.32	0.36	0.17	0.31	0.24	0.88	.028
Forests	0.84	0.67	0.89	0.85	0.97	0.63	.753
Marshes	0.45	0.39	0.39	0.22	0.82	0.81	.002
Farm animals	0.16	0.06	0.24	0.16	0.16	0.13	.699
Wildlife animals	0.60	0.45	0.57	0.54	0.95	0.38	.152
Villages	0.31	0.36	0.35	0.39	0.11	0.25	.527

A Kruskal-Wallis H test showed that there was a statistically significant difference in preferences for cultural heritage between the different outdoor recreation user groups, $\chi2(4) = 21.431$, $p = .000$, with a mean rank preference score of 0.97 for group 1, 1.15 for group 2, 0.87 for group 3, 0.37 for group 4 and 0.19 for group 5. Pairwise comparison with adjusted p-values using a Bonferroni correction, showed that there were significant differences between group 5 and 2 ($p = .009$) and group 4 and 2 ($p = .003$).

The Kruskal-Wallis H test also showed that there was a statistically significant difference in preferences for treelines and hedgerows between the different outdoor recreation user groups, $\chi2(4) = 10.861$, $p = .028$, with a mean rank preference score of 0.36 for group 1, 0.17 for group 2, 0.31 for group 3, 0.24 for group 4 and 0.88 for group 5. Pairwise comparison with adjusted p-values using a Bonferroni correction, showed that there we significant differences between group 2 and 5 ($p = .018$) and group 4 and 5 ($p = .028$).

Table 4
Distribution of outdoor recreationists over independent variables of visitation behavior and outdoor recreation user groups based on landscape preferences (underlined values signal the significant effects of the separate univariate ANOVAs and Chi-square test with $p < .05$). The table only shows those variables with a significant effect; full table available in Annex C.

	% Total sample	Outdoor recreation user group (% within variable)					Significance of group differences
		1	2	3	4	5	
Visitation behavior							
Frequency of visit							
1-3 times per month	19.5	28.2	10.3	30.8	20.5	10.3	.082
1 to 2 times a year	4.5	11.1	33.3	0.0	44.4	11.1	.049
Length of stay							
1 hour	19.5	15.4	12.8	33.3	20.5	17.9	.082
Activities							
Biking	29.5	15.3	18.6	44.1	11.9	10.2	.178
Dog walking	5.0	20.0	10.0	70.0	0.0	0.0	.096
Running	5.5	18.2	0.0	72.7	9.1	0.0	.048
Education	19.5	28.2	30.8	28.2	12.8	0.0	.032
Spirituality	4.5	0.0	22.2	0.0	11.1	66.7	.000
Facilities							
Cultural facilities	28.0	25.0	28.6	28.6	14.3	3.6	.098
Socio-demographic information							
Education							
High school	12.0	4.2	41.7	12.5	33.3	8.3	.010
Academic education	25.5	17.6	11.8	47.1	15.7	7.8	.093
Income							
Between 0.5x average and average	20.0	7.5	20.0	37.5	15.0	20.0	.014

In addition to the differences above, also statistically significant differences in preferences were found for marshes consistent with the overall landscape preferences of the various outdoor recreation user groups ($\chi2(4) = 16.827$, $p = .002$). Pairwise comparison with adjusted p-values using a Bonferroni correction showed that there were significant differences between group 3 and 4 ($p = .004$).

To examine relationships between each outdoor recreation user group and visitation behavior, separate univariate ANOVAs and Chi-square tests were conducted. We detected significant effects of four of the five user groups – with an exception of group 4 – on visitation behavior variables. Results are presented in Table 4.

With regard to the frequency of visit, Chi-square tests revealed that members of the first group ($\chi2(1) = 4.818$, $p = .028$) and members of the second group ($\chi2(1) = 4.443$, $p = .035$) return 1–3 times a month to the recreational area while member of the third group where significantly found to not return 1–2 times a year (0% of recreationists within that variable, Fisher's exact test, $p = .029$). Concerning the length of stay, a significant relationship between group 5 and a length of stay of 1 h (Fisher's exact test, $p = .019$) in the recreational area was found. Pertaining to activities, there is a significant relationship between the membership of group 1 and educational activities ($\chi2(1) = 4.097$, $p = .043$). Moreover, membership of group 3 was found to be significantly related to activities such as biking ($\chi2(1) = 4.195$, $p = .041$), dog walking (Fisher's exact test, $p = .018$) and running (Fisher's exact test $p = .008$). Finally, a significant relationship between membership in group 5 and engagement in spiritual activities (Fisher's exact test $p = .000$) was found.

With respect to facilities, a Chi-square revealed significant effects of the outdoor recreation user group on facilities. Members of the first group were found to visit cultural facilities ($\chi2(1) = 4.097$, p = .043). The other user groups have not shown significant relation to the use of any facilities.

To examine the relationship between outdoor recreation user groups and socio-demographic information, univariate ANOVAs and Chi- square tests were used (see Table 4). Gender and age showed no significant relationship with any outdoor recreation user group. ANOVAs revealed significant relationships between the membership to a specific outdoor recreation user group and the recreationists' income level as well as the level of education. More specifically, recreationists within group 5 were revealed to be correlated to an income level between 0.5 times average and average (Fisher's exact test, $p = .005$). A Pearson's chi-square test revealed association between members of group 3 having an academic education ($\chi2(1) = 5.649$, $p = .017$) or a high school degree ($\chi2(1) = 5.3999$, $p = .020$). The same has been found for members of group 2 having enjoyed academic education ($\chi2(1) = 4.879$, $p = .027$) or having a high school degree ($\chi2(1) = 5.366$, $p = .021$).

3.2.3. Typology of outdoor recreationists

Table 5 gives a summary of the results for the five groups identified based on the PCA regarding landscape element preferences, visitation behaviour, and socio-demographic information. On the basis of these results, the five groups are described in a more interpretative manner below.

Group 1 has a strong interest in landscapes with a higher educational value and a higher degree of human interference (e.g. cultural heritage, farm houses). Returning on average 1–3 times a month, members of this group prefer educational activities and visiting cultural facilities (museums, forts). Recreationists in group 2 have a similar frequency of visit (1–3 visits a month), show preference for a high landscape suitability for sport and a low appreciation of cultural landscapes. They were found to hold at least a high school degree or enjoyed academic education to a marginally larger extent than the other groups whose members in general also followed education at the higher levels. Members from group 3 generally engage in typical short-term activities such as biking, dog walking, and running. Their preferred landscape is characterized by a high degree of scenic beauty and a low degree of uniqueness. Group 4 is significantly defined by only two variables, being their preferences for low values of wilderness and their inclination for marshes as preferred landscape elements. The spirituality of a landscape is what attracts members from group 5, who appear to associate the spiritual qualities of a landscape primarily with tree lines and hedgerows. They undertake spiritual activities but show no affinity with educational endeavours. The duration of their average stay is relatively short (1 h), while their income is below average.

3.3. Cluster analysis–based typology

We determined a maximum number of 5 clusters by applying a hierarchical procedure on the data, a technique commonly used by market researchers (see e.g. Punji and Stewart, 1983). We then performed a selected number of K-means cluster analyses – here solutions with five, four, three and two clusters respectively – and analyzed the data regarding the contents. Inspired by the method used by Elands and Lengkeek (2012), we selected a 3-cluster solution that could be interpreted consistently and avoided groups of only a few members (see Table 6).

Cluster 1 is attracted to landscapes for their spiritual qualities, described by one participant as those characteristics that "provide the possibility to clear your mind, to be away from your daily routines and to release yourself from stress." The preferred landscape of this group is characterized by semi-natural elements such as meadows, agricultural land, farm animals, and tree lines and hedgerows. Cluster members do generally not use any facilities, the average visit is comparably short (1 h or half a day), while the frequency of visiting is relatively high, varying from daily to – at least – nearly every month. Typical short-term activities score highest and include dog walking, jogging, race biking, wild food collecting, and spirituality-related activities. The willingness to travel to the recreation destination is considerably low for this group as most members lived within an 8 km radius. Regarding socio-demographics, the members of this group are in general higher

Table 5
Landscape preference-based outdoor recreation user groups, showing statistical significant relationships with variables related to landscape preferences, visitation behavior and socio-demographics.

	Outdoor recreation user groups				
	1 (n = 33)	2 (n = 46)	3 (n = 67)	4 (n = 38)	5 (n = 16)
Landscape preferences					
Landscape characteristics	Low degree of naturalness High educational level of a landscape High degree of human disturbance	Low occurrence of cultural heritage in a landscape High suitability for sport tourism	Low degree of uniqueness of a landscape High degree of attractiveness/ scenic beauty	Low degree of wilderness	High degree of spirituality
Landscape elements	n/a	Cultural heritage	n/a	Marshes	Tree lines and Hedgerows
Visitation behavior					
Activities	Educational activities	n/a	Biking Dog walking Running	n/a	Spiritual activities
Facilities	Cultural facilities	n/a	n/a	n/a	n/a
Frequency of visit	1-3 times a month	1-3 times a month	n/a	n/a	n/a
Length of stay	n/a	n/a	n/a	n/a	1 hour
Travel distance from place of residence	n/a	n/a	n/a	n/a	n/a
Socio-demographic information					
Education	n/a	Academic education High school degree	Academic education High school degree	n/a	n/a
Income	n/a	n/a	n/a	n/a	Between 0,5x average and average

Table 6
Clusters emerging from cluster analysis including data on landscape preferences, visitation behavior and socio-demographics.

	Clusters of outdoor recreationists		
	1 (n = 91)	2 (n = 55)	3 (n = 54)
Landscape preferences			
Landscape characteristics	Spiritual characteristics of a landscape	Scenic beauty of a landscape Cultural heritage landscapes	Naturalness of a landscape Opportunities for sport recreation Unique character of a landscape Human influence in a landscape Educational landscapes Wild nature
Landscape elements	Meadow Agricultural land Tree lines and Hedgerows Farm animals	Availability of cultural heritage Orchard Presence of villages	Rivers/Water Forest Marshes Wild animals
Visitation behavior			
Activities	Dog walking Running Race biking Wild food Spirituality	Biking Picnicking Education Other activities	Hiking Fishing
Facilities		Gastronomy Accommodation Cultural facilities	Local products Other facilities
Frequency of visit	Daily 1 or several times a week Nearly every month	More than 2 times a year. This is the first time in minimal a year.	1 to 3 times per month 1 to 2 times per year
Length of stay	1 hour Half a day	Longer than half a day	2-3 hours
Travel distance from place of residence	0-8 km	> 75	8-75 km
Socio-demographic information			
Education	Basic education High school Academic education	None Higher professional education	None Middle-level applied education
Income	Between 0,5x average and average	More than 2x average I'd rather not say.	Beneath 0,5x average About average Between average and 2x average
Gender	Female	Male	Female
Age	> 45	> 55	18-45

educated than members of the other groups. The average income, on the other hand, is lowest of the three clusters, even though there are a few exceptions that earn more than two times the average wage. The archetypical member is female and older than 45.

Cluster 2 is especially interested in landscapes of high scenic beauty and cultural heritage sites, such as fruit orchards and villages that are typical for the case study area. One member of this cluster said that what he appreciated most about the area was the diversity of the landscape, with its combination of nature, agricultural plots and historical sites. Members of this cluster, in contrast to cluster 1, make use of a wide variety of facilities including gastronomy, accommodation and cultural facilities. Their return rate is lowest (less than once a month), while they spend the most time in the area per visit (half a day up to a day), primarily engaging in activities such as biking, picnicking, and educational activities. They often followed higher professional education and have the highest income of the three groups with more than 2 times the average income. The average age category was 55 years or older and most cluster members were male. The cluster showed the highest willingness to travel (more than 75 km).

Members of cluster 3 appreciate human interference in the landscape, which they additionally value for the possibilities it offers for sportive recreation and educational activities, including hiking and fishing. Landscape elements that best define the preferences of this cluster are commonly associated with naturalness and wild nature, and include rivers and water, forests, marshes, and wild animals. Moreover, the uniqueness of the landscape is highly valued by this user group. One visitor described a sense of wonder and amazement as she was walking through the area: *"Around every corner something new awaits you, every new spot has its own unique character."* With willingness to travel, visitation frequency and duration of stay all striking a mean between the other two groups, cluster 2 distinguishes itself by its facility use (public facilities and local food) and demographic profile: predominantly females between 18 and 45 with the lowest average education level of the three clusters. Their average income fluctuates between 0,5 and 2 times the average wage.

A discriminant function analysis (DFA) was conducted to verify whether there is a statistically significant difference between the groups and which variables significantly discriminate between the different groups. The first discriminant function explained 75% of the variance, canonical $R^2 = .87$, whereas the second explained 25%, canonical $R^2 = .70$. In combination these discriminant functions significantly differentiated the user groups, $\lambda = 0.04$, $\chi 2(128) = 540.77$ $p = .00$. Removing the first function indicated that the second function did also significantly differentiate the user groups, $\lambda = 0.30$, $\chi 2(63) = 197.95$, $p = .00$. A test of equality of group means determined that about 40% of the clustering variables was significantly different amongst groups. See Annex D for more information on how the clustering variables contributed to the two revealed functions significantly discriminating the identified outdoor recreation user groups.

4. Discussion & conclusion

Efficient land use planning and policy that allows multiple forms of recreation in peri-urban landscapes can benefit from the characterization of different types of outdoor recreationists on the basis of their heterogeneous preferences (Bell et al., 2007; Komossa et al., 2018; Pröbstl et al., 2010). With the exception of a few case studies (see e.g. De Groot and Van den Born, 2003; Devesa et al., 2010), studies making a typology of outdoor recreation user groups have often not included landscape preferences, visitation behavior as well as socio-demographic information in a systematic way. Our study provides such a typology on case study level accounting for variations in the aforementioned three aspects. Simultaneously, we compared two commonly used data-driven methods for typology development. A comparison of the results of both analyses is provided in the following together with a discussion of the possible implementations of this study.

4.1. Comparison of the PCA- and cluster analysis-based typology

In the present study, we used two different data-analysis methods and compared the resulting PCA- and Cluster analysis-based typology. While the resulting typologies cannot be linked directly, a comparison of the main distinctions and resulting groups can be made. Despite the differences in methodology and the factors used for deriving the typologies, a comparison of the results of the two analyses leads to a consistent picture of three distinct outdoor recreation user groups. Hereafter, we refer to these groups as 'the convenience recreationist', 'the day tripper' and 'the culture/nature recreationist'.

'The convenience recreationist' – largely resembling group 3 (PCA) and cluster 1 (cluster analysis) – shows interest in short-term activities such as running and dog walking, with minor variation between the analyses concerning activities such as biking or race-biking. Where the

PCA-based approach could not find any significant relation with other variables of visitation behaviour, the cluster analysis depicted that this user group travels only short distances to the recreation area (0–8 km), to which they return frequently (daily – nearly every month), spending between 1 h up to half a day in the area. These findings are concurrent with Paracchini et al. (2014), who likewise found a travel distance of maximum 8 km for close-to-home recreation. A recent survey by Natural England (2016), on the other hand, encountered a much greater willingness to travel for typical short-term activities such as running and dog walking: 112 and 113 km respectively. Regarding duration of stay, there appears to be a general consensus in the literature, with averages fluctuating between 1 and 6 h (Ezebilo et al., 2015; Natural England, 2016; Roovers et al., 2002). Regarding preferences for landscape characteristics, the two types of analyses did not show agreement in the identified groups. In the PCA-based results, the user groups were distinguished by the preference for a high degree of attractiveness and a low degree of uniqueness of a landscape. The cluster analysis-based results showed differentiation based on preferences for the landscape's spiritual character. This is however not mutually exclusive; one respondent explained that spirituality mainly concerns freeing your mind and releasing yourself from the stress of daily life, and the attractiveness of a landscape – irrespective of its uniqueness – can be highly instrumental in this respect. Other case studies have confirmed this reading. In their study on rural tourism in the Lake District, England, Sharpley and Jepson (2011) found that recreationists enjoyed the countryside to counterbalance the hastiness of their everyday urban lives. Only the cluster analysis-based results depicted preferences for certain landscape elements such as meadows, tree lines, and farm animals. These results were not unexpected, as these elements are most characteristic for the Kromme Rijn area, where dairy farming is the second most important agricultural sector (CBS, 2016; Provincie Utrecht, 2016).

'The day tripper' user group can be identified in group 2 (PCA) and cluster 2 (cluster analysis). The cluster analysis-based results show preferences for scenic beauty and reveals a preference for educational activities and picnicking. Also, preferences for biking as a sportive activity were found, which can be related to the preferences for a landscape's suitability for sport recreation as found by the PCA-based approach. Where the cluster analysis showed preferences for cultural heritage landscapes, the PCA indicated that these preferences are mostly related to low values of cultural heritage in a landscape. However, sport tourism, scenic beauty and cultural landscapes – seemingly at odds – do not necessarily exclude each other as can be discerned from the comments of multiple respondents. Engaging in a variety of activities, the one more sportive than the other, several of them expressed their enthusiasm for especially the diversity of landscapes the Kromme Rijn area has to offer, which in one way or the other includes cultural heritage but does not put heritage central. One participant praised the area for the ample opportunities it offered for a wide range of activities, including walking, jogging, and cycling, but also generally enjoying the visual splendour of the surroundings, which encompasses both natural and cultural elements, including forts and traditional windmills. While the PCA-based approach could not find significant relationships between this specific user group and preferences for specific landscape elements, the cluster analysis-based results showed preferences for orchards and the presence of villages. Orchards are a distinctive landscape element of the Kromme Rijn area, where the cultivation of apples, pears and cherries forms a central part of the economy (AVP, 2007; LOS stadomland, 2016). Both analyses have shown that the frequency of visit is somewhat lower than for the first user group. Furthermore, the cluster analysis revealed a longer length of stay (half a day or longer) and a longer travel distance from the place of residence, of more than 75 km. These numbers are corroborated by other studies (Natural England, 2016; Paracchini et al., 2014), although particular studies found a length of stay of less than half a day (CBS, 2010; Roovers et al., 2002).

'The culture/nature recreationist' user group is formed by recreationists with a deeper interest in the area's natural and cultural setting. From both the cluster (cluster 3) and PCA-based results (group 1, 4 and 5), preferences for landscapes described as 'wild nature' or 'natural' emerge, while there is also a certain interest for landscapes with a high degree of human influence and a high educational value. There are only minor differences between the analyses. The PCA-based results show that preferences related to wilderness and naturalness are mainly expressed through relatively low values of these variables. This is not surprising: many interviewees had the impression that true wilderness "does not really exist in the Netherlands", often adding that although they had a penchant for this type of landscape, they were aware of the fact that these landscapes were not found in the Kromme Rijn area. Both analyses agree on marshes as landscape elements best describing these preferences. The cluster analysis-based results add landscape elements such as rivers and water, forest and wild animals to the list. The preference for marshland can be explained from the generally wild, unspoiled nature of this type of landscape that offers a habitat for a wide variety of animal species (Keddy, 2010). Regarding visitation behavior, both analyses agree on preferences for educational activities. While the cluster analysis-based results show preferences for activities such as hiking and fishing, PCA-based results depict preferences for spiritual activities. A literature review by Mocior and Kruse (2016) on the educational values and services of ecosystems and landscapes shows similar findings. This paper assesses that nature-oriented recreation such as hiking, kayaking, wildlife watching, viewing scenery or fishing has an important educative component. While with the PCA-based approach we could not find a significant relation of this user group regarding any travel distance from the recreationists' place of residence, the cluster-analysis results show that this user group is willing to travel a distance between 8 km and 75 km to the recreation destination. These findings are not supported by Natural England (2016), which also with reference to outdoor activities such as fishing and climbing established longer travel distances of on average 146 km. Our numbers are however congruent with Paracchini et al. (2014) and Brämer (2011), who found distances of 80 km and 30 km respectively.

By comparing the two approaches of data analysis, we obtained a deeper insight into the extent to which the choice for a specific method influences the formulation of a recreationist typology. Overall, both types of analysis yielded corresponding results and led to consistent groups of outdoor recreationists due to the use of the same input data. Deviations between the results of the PCA and cluster-analysis-based approach can be ascribed to different use of the data sets. The main deviations occurring between the two approaches concern the number of variables that significantly differ among user groups. The percentage of variables that are significantly different among user groups is generally higher in the cluster analysis-based approach given the fact that this approach, such as we have implemented it in this paper, optimizes the differences amongst all the variables. It is often criticized that by using a large number of variables in cluster analysis, many relations or clusters will be produced automatically, regardless of their actual existence (Ben-Hur and Guyon, 2003). However, by choosing K-mean clustering over hierarchical clustering, we were trying to minimalize this trend, as this non-hierarchical technique is less affected by outliers as well as the presence of irrelevant clustering variables and is therefore especially suitable especially if many clustering variables are used (Mooi and Sarstedt, 2011). Whereas for the PCA-based approach only 16.1% of the clustering variables were found to be significantly different amongst groups, this number increases up to 40% for the cluster analysis-based approach. This general trend holds true also for the percentage of significantly different variables of visitation behavior (12.5% versus 53%) as well as landscape element preferences (27% versus 45%). As an example of the aforementioned trend, the cluster analysis shows a low willingness to travel among the cluster termed 'convenience recreationists' (most members lived within an 8 km radius) – something that did not show up in the comparable groups

engendered by the PCA – while the visitation behavior of the 'day trippers' also differed between the two approaches, with the cluster analysis distinguishing a pattern – the use of a wide variety of facilities including gastronomy, accommodation and cultural facilities – that the PCA did not pick up on. For both analyses, 15.8% of the socio-demographic variables were significantly different among user groups.

The PCA analysis was – based on our choice – only accounting for variables regarding preferences for landscape characteristics while the cluster analysis was aimed at partitioning of the variance between all variables. Consistently, within the PCA-based approach, variables for landscape preferences show the highest number of significant differences among user groups. Within the cluster analysis-based approach on the other hand, variables for visitation behavior show the highest number of significant differences. In other words, the assignment of a central role to preferences for specific landscape characteristics in the PCA has not only influenced the percentage of variables that are significantly different among user groups but also influenced which of the three aspects – landscape preferences, visitation behaviour, socio-demographic information – is more prevailing in group distinction.

As recreational choices depend on multiple dimensions, the use of more than one method for the formulation of a typology provided complementary insights and helped the fine-tuning of recreation typologies.

4.2. Implications

Previous studies that focussed on developing typologies of outdoor recreationists, like Elands and Lengkeek (2000) and Cottrell et al. (2005), have taken into account variations of user groups with regard to socio-demographic background and visitation behaviour. In accordance with these studies we found clearly different user groups. However, the results of the present study go beyond these studies by demonstrating the importance of landscape preferences alongside the earlier mentioned aspects. The inclusion of landscape preferences helps establishing a better link between landscape management and the recreational sector. In spite of some relations with socio-demographic conditions, landscape preferences are largely independent and can explain part of the visitation behaviour. At the same time, the different types of recreationists are corresponding to archetypical notions of different recreation groups. The particular characteristics of the study region co-determine the associations to landscape elements and the socio-demographic conditions. Bearing this in mind, it has to be mentioned that the survey was conducted in the autumn, which may have led to a certain bias in the interviewed recreationists. We however estimate this effect to be small as most recreation activities are not strongly seasonal in this region.

Our study emphasizes the importance of destination management, which could benefit from knowledge about variations between outdoor recreation user groups. Conflicts between various types of recreational users visiting an area may arise as result of significant variations in their desired recreational experiences, recreational preferences, and environmental impact (Boyd and Butler, 1996). Facilities and landscape management may not cater to all groups in the same way and targeting to specific groups may be needed. Exploring the preferences and characteristics of different user groups can help to segment the tourism market and develop new marketing strategies to be able to attract specific recreation user groups to specific areas (Boo, 1990; Kozak, 2002).

Moreover, knowledge about outdoor recreation user groups is especially important in peri-urban areas, owing to their multifunctional character. Multifunctional land use is likely to cause land-use conflicts that occur when different user groups have incompatible interests related to certain land-use units (Steiner, 2012; Von der Dunk et al., 2011). Recreation-based conflicts have increased in recent decades, due to growing demand for outdoor recreation and the increased diversity of recreational pursuits (Hammitt and Schneider, 2000; Emborg and Gamborg, 2016; Reis and Higham, 2009). Besides conflicts between recreationists and other land users (e.g. local residents, farmers), also conflicts between different groups of recreationists forms a recurring problem facing managers, stakeholders and policy makers (see e.g. Jackson and Wong, 1982; Schneider et al., 2013; Pröbstl-Haider et al., 2018). Typically such recreational conflicts evolve through either direct contact and indirect confrontation, with one party more powerful and/or dependent than the other (Emborg and Gamborg, 2016).

Differentiating between various recreational groups would help policy makers in finding sustainable solutions for such recreation-related conflicts. Landscape management and land use policy can, accordingly, include the identification of different recreationist user groups in the formulation of strategies to target these various groups, while recreation facilities can be aligned to the preferred landscape characteristics of specific recreation user groups (Baggio and Scaglione, 2017). Employing this targeted approach would arguably be more effective than treating recreationists as one undifferentiated group (Gottfried et al., 1996).

A future potential continuation of this study would be to spatially assess the actual visitors flows per outdoor recreation user group, taking into account the user groups movement patterns, environmental impact and outdoor recreational demand trends with the aim to spatial-explicitly point out current and potential future land-use conflicts.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.landusepol.2018.10.017.

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